WHAT IS CLAIMED AS NEW AND IS DESIRED TO BE SECURED BY LETTERS PATENT OF THE UNITED STATE IS:

Related Pending Application
Related Case Serial No: 09/653,336
Related Case Filing Date: 08-31-00

JC825 U.S. PTO
09/764264
01/19/01

1. A coordinate inputting/detecting apparatus, in which a designating device configured to designate a position in an at least substantially flat two-dimensional coordinate inputting/detecting area of the coordinate inputting/detecting apparatus is judged as located in a predetermined range of the coordinate inputting/detecting area when an optical detection signal of an optical unit, configured to optically detect the designating device inserted into the predetermined range of the coordinate inputting/detecting area, exceeds a first threshold value, and in which whether or not the designating device has been inserted into the predetermined range of the coordinate inputting/detecting area is judged and coordinates of a position in the coordinate inputting/detecting area, designated by the designating device inserted in the predetermined range of the coordinate inputting/detecting area, are recognized in accordance with the optical detection signal of the optical unit, wherein a second threshold value used in recognizing the coordinates of the position in the coordinate inputting/detecting area, designated by the designating device inserted in the predetermined range of the coordinate inputting/detecting area, is set to be higher than the first threshold value used in judging if the designating device has been inserted into the predetermined range of the coordinate inputting/detecting area.

2. A coordinate inputting/detecting apparatus, comprising:

a two-dimensional coordinate inputting/detecting area that is at least substantially flat;

a designating device configured to designate a position in the coordinate inputting/detecting area;

an optical unit configured to optically detect the designating device inserted into a predetermined range of the coordinate inputting/detecting area and to output a detection signal according to a result of the detection;

a judging device configured to judge whether the designating device has been inserted into the predetermined range of the coordinate inputting/detecting area when the detection signal of the optical unit exceeds a first threshold value;

a recognition device configured to obtain coordinates of a position in the coordinate

inputting/detecting area, designated by the designating device inserted in the predetermined range of the coordinate inputting/detecting area, by utilizing the detection signal; and

a first threshold value prescribing device configured to prescribe a second threshold value, which is used by the recognition device in obtaining the coordinates of the position in the coordinate inputting/detecting area, designated by the designating device inserted in the predetermined range of the coordinate inputting/detecting area, said second threshold value being higher than the first threshold value.

3. A coordinate inputting/detecting apparatus of Claim 2, further comprising:

a distance judging device configured to determine a distance between the designating device inserted into the predetermined range of the coordinate inputting/detecting area and the optical unit; and

a second threshold value prescribing device configured to prescribe, according to a result of the judgement by the distance judging device as to the distance between the designating device inserted into the predetermined range of the coordinate inputting/detecting area and the optical unit, the first threshold value, such that the first threshold value is decreased as the distance between the designating device inserted into the predetermined range of the coordinate inputting/detecting area and the optical unit is increased.

4. A coordinate inputting/detecting apparatus of Claim 2, wherein the second threshold value prescribing device prescribes the first threshold value such that if the designating device is located at a farthest point from the optical unit in the coordinate inputting/detecting area, the designating device can be judged as having been inserted into the predetermined range of the coordinate inputting/detecting area.

5. A coordinate inputting/detecting apparatus of Claim 3, wherein the optical unit comprises at least first and second optical units, and wherein the second threshold value prescribing device prescribes the first threshold value for each of the first and second optical units.

6. A coordinate inputting/detecting apparatus, in which designating means for

designating a position on at least substantially flat two-dimensional coordinate inputting/detecting area of the apparatus is judged as located in a predetermined range of the two-dimensional coordinate inputting/detecting area of the apparatus, and in which whether or not the designating means has been inserted into the predetermined range of the coordinate inputting/detecting area is judged and coordinates of a position in the coordinate inputting/detecting area, designated by the designating means, are recognized, wherein a threshold value used in recognizing the coordinate of the position in the coordinate inputting/detecting area designated by the designating means inserted into the predetermined range of the coordinate inputting/detecting area is set to be higher than a threshold value used in judging if the designating means has been inserted into the predetermined range of the coordinate inputting/detecting area.

7. A coordinate inputting/detecting apparatus, comprising:

a two-dimensional coordinate inputting/detecting area that is at least substantially flat;

designating means for designating a position in the coordinate inputting/detecting area;

optical detecting means for optically detecting the designating means inserted into a predetermined range of the coordinate inputting/detecting area and for outputting a detection signal according to a result of the detection;

judging means for judging whether the designating means has been inserted into the predetermined range of the coordinate inputting/detecting area;

recognizing means for obtaining coordinates of a position in the coordinate inputting/detecting area, designated by the designating means inserted into the predetermined range of the coordinate inputting/detecting area; and

first threshold value prescribing means for prescribing a threshold value used by the recognizing means in obtaining the coordinates of the position in the coordinate inputting/detecting area, designated by the designating means inserted into the predetermined range of the coordinate inputting/detecting area, to be higher than a threshold value used by the judging means in judging whether or not the designating means has been inserted into the predetermined range of the coordinate inputting/detecting area.

8. A coordinate inputting/detecting apparatus of Claim 7, further comprising:

distance judging means for determining a distance between the designating means inserted into the predetermined range of the coordinate inputting/detecting area and the optical detecting means; and

second threshold value prescribing means for prescribing, according to a result of the judgement by the distance judging means as to the distance between the designating means inserted into the predetermined range of the coordinate inputting/detecting area and the optical detecting means, the threshold value used when the recognizing means recognizes the coordinates of the position in the coordinate inputting/detecting area, such that the threshold value is decreased as the distance between the designating means inserted into the predetermined range of the coordinate inputting/detecting area and the optical detecting means is increased.

9. A coordinate inputting/detecting apparatus of Claim 7, wherein the second threshold value prescribing means prescribes the threshold values such that if the designating means is located at a farthest point from the optical detecting means in the coordinate inputting/detecting, the designating means can be judged as having been inserted into the predetermined range of the coordinate inputting/detecting area.

10. A coordinate inputting/detecting apparatus of Claim 9, wherein the optical detecting means comprises at least first and second optical detecting means, and wherein the second threshold value prescribing means prescribes the first threshold value for each of the first and second optical detecting means.

11. A method of inputting/detecting coordinates of a position designated by a designating device in an at least substantially flat two-dimensional coordinate inputting/detecting area of a coordinate inputting/detecting apparatus, the method comprising steps of:

judging whether the designating device is located in a predetermined range of the two-dimensional coordinate inputting/detecting area of the coordinate inputting/detecting apparatus, when an optical detection signal based on detecting the designating device inserted

into the predetermined range of the coordinate inputting/detecting area, exceeds a first threshold value; and

judging whether or not the designating device has been inserted into the predetermined range of the coordinate inputting/detecting area and recognizing coordinates of the position in the coordinate inputting/detecting area, designated by the designating device inserted into the predetermined range of the coordinate inputting/detecting area, in accordance with the optical detection signal;

wherein a second threshold value used in recognizing the coordinates of a position in the coordinate inputting/detecting area, designated by the designating device inserted into the predetermined range of the coordinate inputting/detecting area, is set to be higher than the first threshold value used in judging if the designating device has been inserted into the predetermined range of the coordinate inputting/detecting area.

12. A method of inputting/detecting coordinates of a position designated by a designating device in an at least substantially flat two-dimensional coordinate inputting/detecting area of a coordinate inputting/detecting apparatus, the method comprising steps of:

optically detecting with an optical detecting device the designating device inserted into a predetermined range of the coordinate inputting/detecting area and outputting a detection signal according to a result of the detection;

judging whether the designating device has been inserted into the predetermined range of the coordinate inputting/detecting area when the detection signal exceeds a first threshold value;

recognizing coordinates of a position in the coordinate inputting/detecting area, designated by the designating device inserted into the predetermined range of the coordinate inputting/detecting area, by utilizing the detection signal; and

prescribing a second threshold value, which is used in recognizing the coordinates of the position in the coordinate inputting/detecting area, designated by the designating device inserted into the predetermined range of the coordinate inputting/detecting area, so as to be higher than the first threshold value.

13. A method of Claim 12, further comprising steps of:

determining a distance between the designating device inserted into the predetermined range of the coordinate inputting/detecting area and the optical detecting device; and

prescribing, according to a result of the determination as to the distance between the designating device inserted into the predetermined range of the coordinate inputting/detecting area and the optical detecting device, the first threshold value, such that the first threshold value is decreased as the distance between the designating device inserted in the predetermined range of the coordinate inputting/detecting area and the optical detecting device is increased.

14. A method of Claim 12, wherein the first threshold value is prescribed such that if the designating device is located at a farthest point from the optical detecting device in the coordinate inputting/detecting area, the designating device can be judged as having been inserted into the predetermined range of the coordinate inputting/detecting area.

15. A method of Claim 13, wherein the optical detecting device comprises at least two optical detecting units, and wherein the first threshold value is prescribed for each of the two optical detecting units.

16. A computer program product, comprising:

a computer storage medium and a computer program code mechanism embedded in the computer storage medium for causing a computer to control inputting/detecting of coordinates of a position designated by a designating device in an at least substantially flat two-dimensional coordinate inputting/detecting area of a coordinate inputting/detecting apparatus, the computer program code mechanism including:

a first computer code device configured to judge whether the designating device is located in a predetermined range of the coordinate inputting/detecting area of the coordinate inputting/detecting apparatus when an optical detection signal of an optical detecting device, that optically detects the designating device inserted into the predetermined range of the coordinate inputting/detecting area, exceeds a first threshold value; and

a second computer code device configured to judge whether or not the

designating device has been inserted into the predetermined range of the coordinate inputting/detecting area and to recognize coordinates of a position in the coordinate inputting/detecting area, designated by the designating device inserted into the predetermined range of the coordinate inputting/detecting area, in accordance with the optical detection signal of the optical detecting device;

wherein a second threshold value used in recognizing the coordinates of the position in the coordinate inputting/detecting area, designated by the designating device inserted into the predetermined range of the coordinate inputting/detecting area, is set to be higher than the first threshold value used in judging if the designating device has been inserted into the predetermined range of the coordinate inputting/detecting area.

17. A computer program product, comprising:

a computer storage medium and a computer program code mechanism embedded in the computer storage medium for causing a computer to control inputting/detecting coordinates of a position designated by a designating device in an at least substantially flat two-dimensional coordinate inputting/detecting area of a coordinate inputting/detecting apparatus, the computer program code mechanism including:

a first computer code device configured to optically detect with an optical detecting device the designating device inserted into a predetermined range of the coordinate inputting/detecting area and to output a detection signal according to a result of the detection;

a second computer code device configured to judge whether the designating device has been inserted into the predetermined range of the coordinate inputting/detecting area when the detection signal exceeds a first threshold value;

a third computer code device configured to recognize coordinates of a position in the coordinate inputting/detecting area, designated by the designating device inserted into the predetermined range of the coordinate inputting/detecting area, by utilizing the detection signal; and

a fourth computer code device configured to prescribe a second threshold value, which is used in recognizing the coordinates of the position in the coordinate inputting/detecting area, designated by the designating device inserted into the predetermined range of the coordinate inputting/detecting area, so as to be higher than the first threshold

value.

18. A computer program product of Claim 17, the computer program code mechanism further including;

a fifth computer code device configured to determine a distance between the designating device inserted into the predetermined range of the coordinate inputting/detecting area and the optical detecting device; and

a seventh computer coded device configured to prescribe, according to a result of the judgement as to the distance between the designating device inserted into the predetermined range of the coordinate inputting/detecting area and the optical detecting device, the first threshold value, such that the threshold value is decreased as the distance between the designating device inserted into the predetermined range of the coordinate inputting/detecting area and the optical detecting device is increased.

19. A computer program product of Claim 17, wherein the first threshold value is prescribed such that if the designating device is located at a farthest point from the optical detecting device in the coordinate inputting/detecting area, the designating device can be judged as having been inserted into the predetermined range of the coordinate inputting/detecting area.

20. A computer program product of Claim 18, wherein the optical detecting device comprises at least first and second optical units, and wherein the first threshold value is prescribed for each of the first and second optical units.

FIG. 1

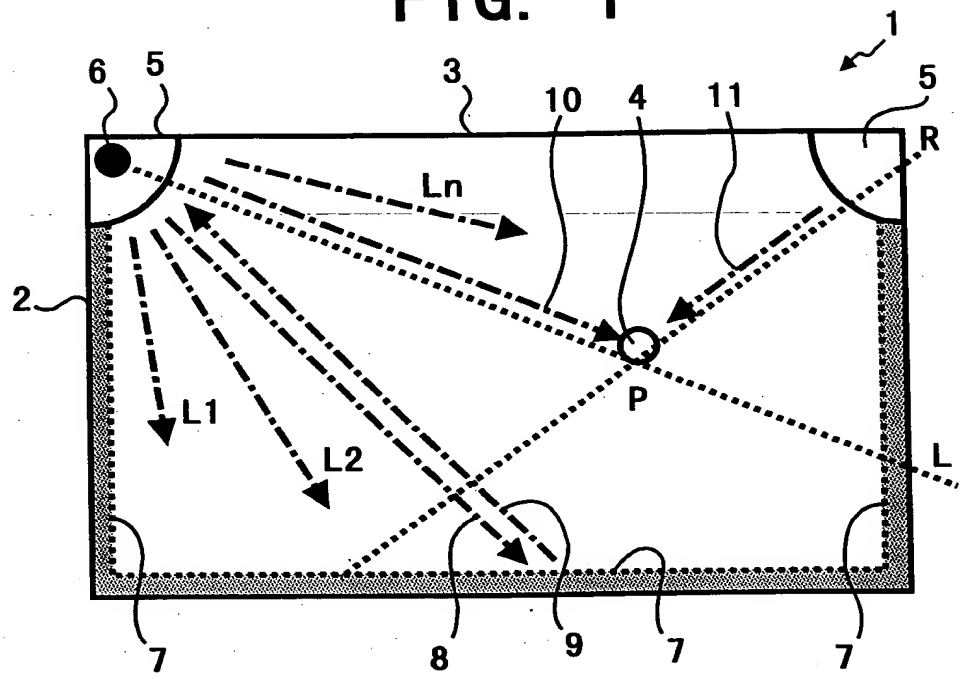


FIG. 2

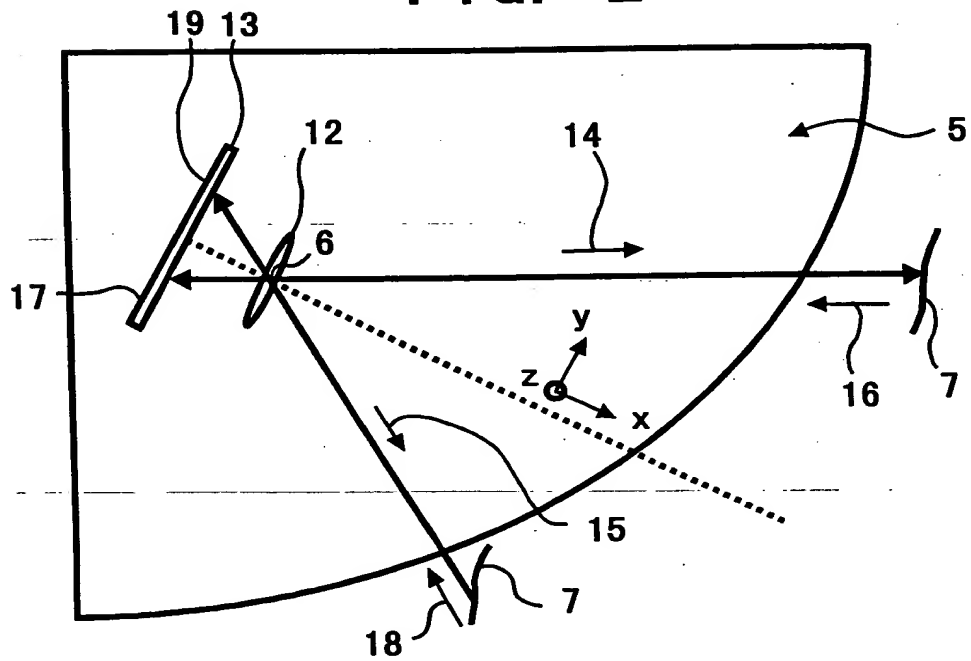


FIG. 3

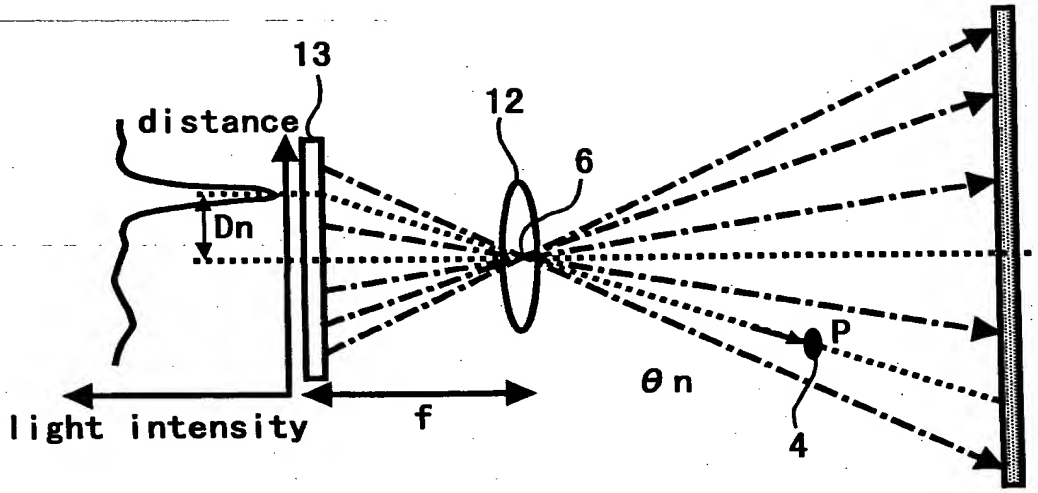

13
distance
12
6
Dn
P
θn
light intensity
f
4

FIG. 4

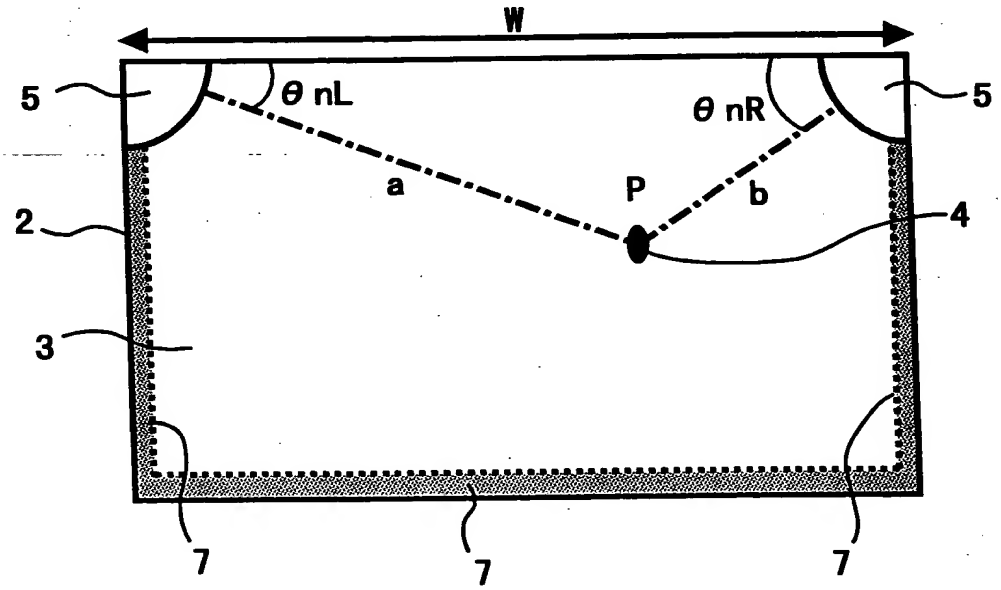

W
5
θnL
θnR
5
a
P
b
2
4
3
7
7
7

FIG. 5

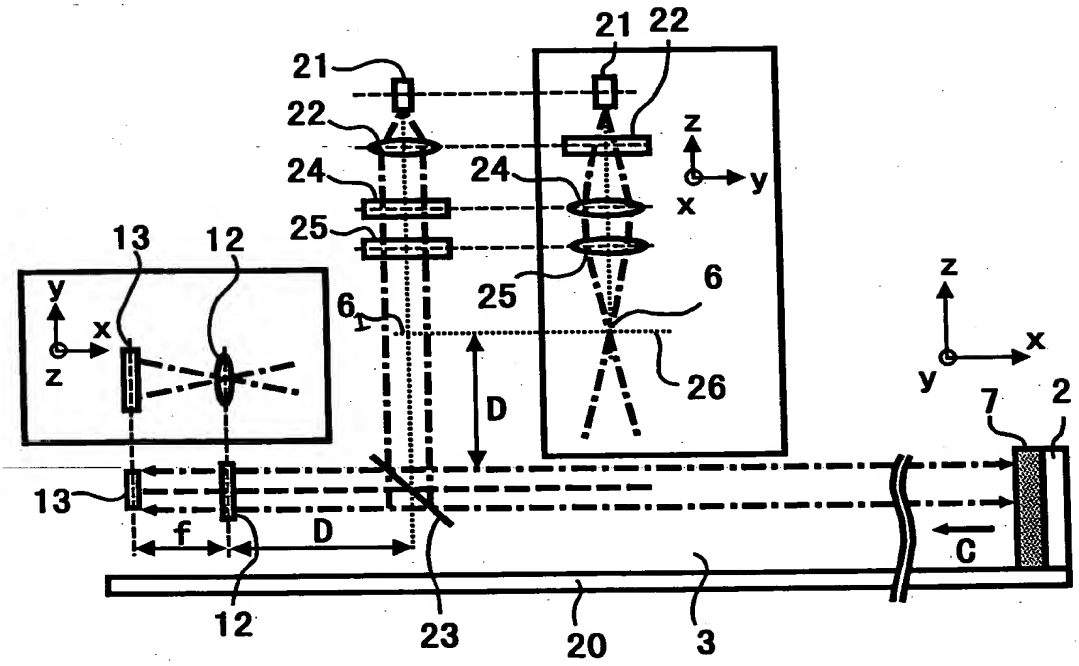


FIG. 6

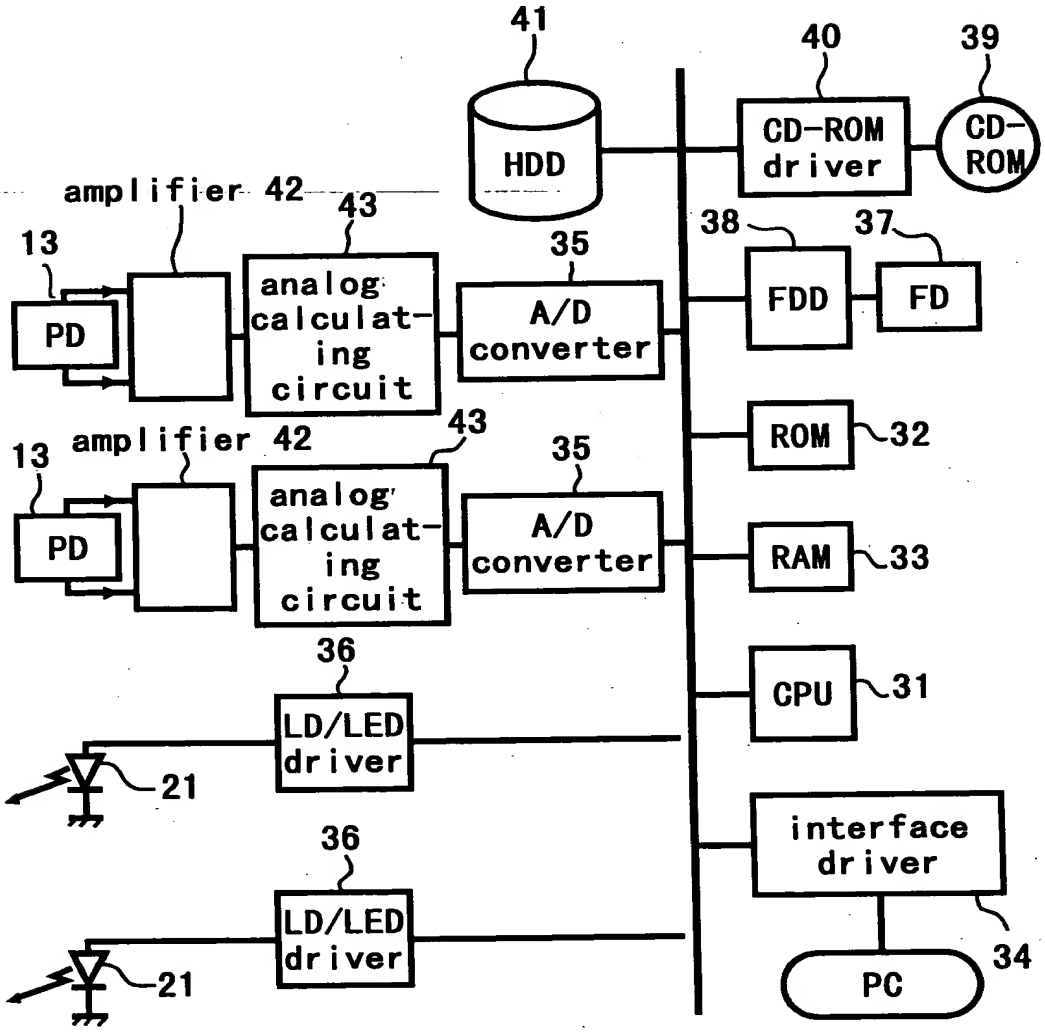

41
HDD
40
CD-ROM driver
39
CD-ROM
amplifier 42
43
13
PD
analog calculating circuit
35
A/D converter
38
FDD
37
FD
ROM
32
13
amplifier 42
43
PD
analog calculating circuit
35
A/D converter
RAM
33
36
LD/LED driver
CPU
31
21
36
interface driver
LD/LED driver
21
34
PC

FIG. 7A

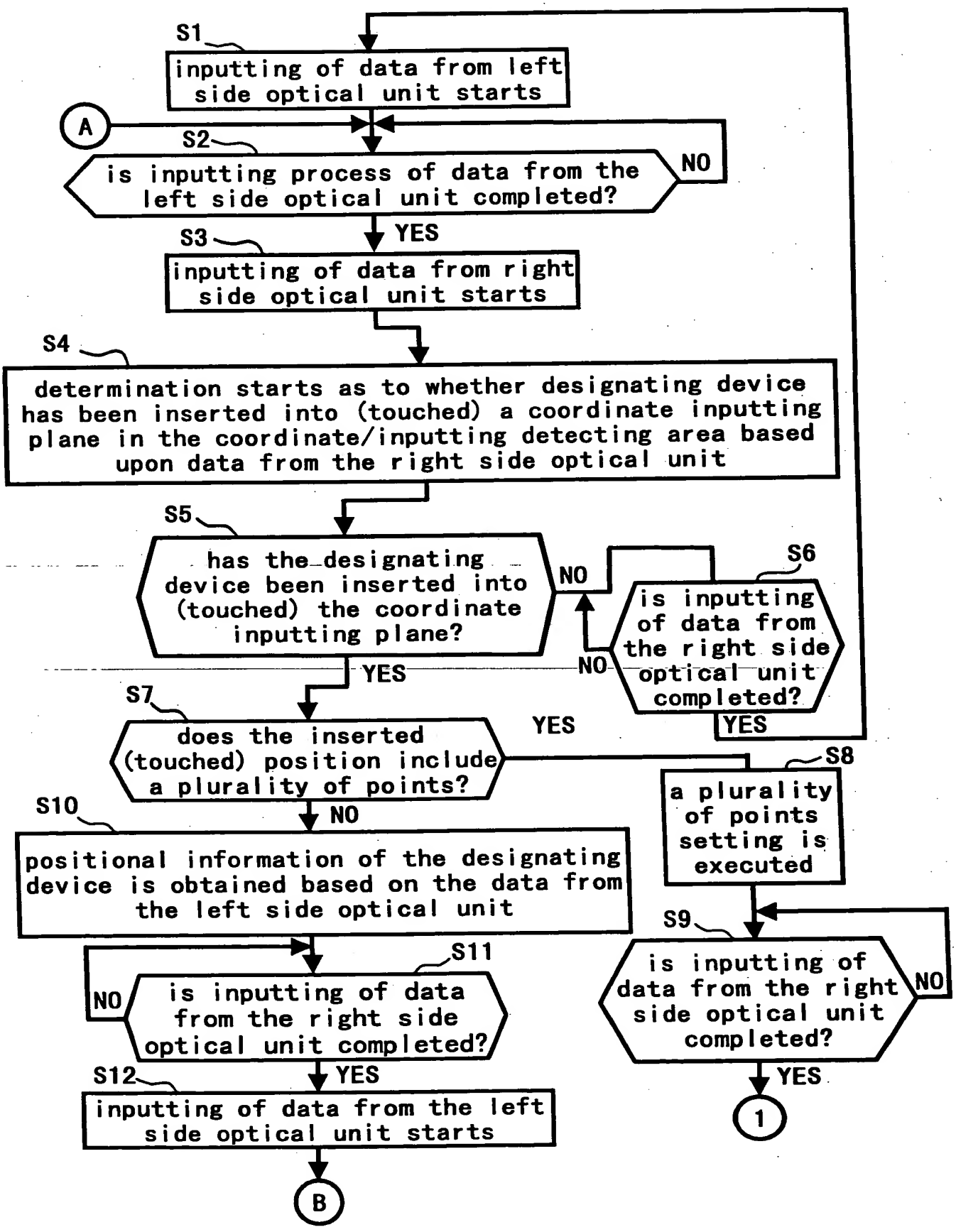

S1
inputting of data from left side optical unit starts
A
S2
is inputting process of data from the left side optical unit completed?
NO
YES
S3
inputting of data from right side optical unit starts
S4
determination starts as to whether designating device has been inserted into (touched) a coordinate inputting plane in the coordinate/inputting detecting area based upon data from the right side optical unit
S5
has the designating device been inserted into (touched) the coordinate inputting plane?
NO
S6
is inputting of data from the right side optical unit completed?
NO
YES
YES
S7
does the inserted (touched) position include a plurality of points?
YES
S8
a plurality of points setting is executed
S9
is inputting of data from the right side optical unit completed?
NO
YES
1
NO
S10
positional information of the designating device is obtained based on the data from the left side optical unit
S11
NO
is inputting of data from the right side optical unit completed?
YES
S12
inputting of data from the left side optical unit starts
B

FIG. 7B

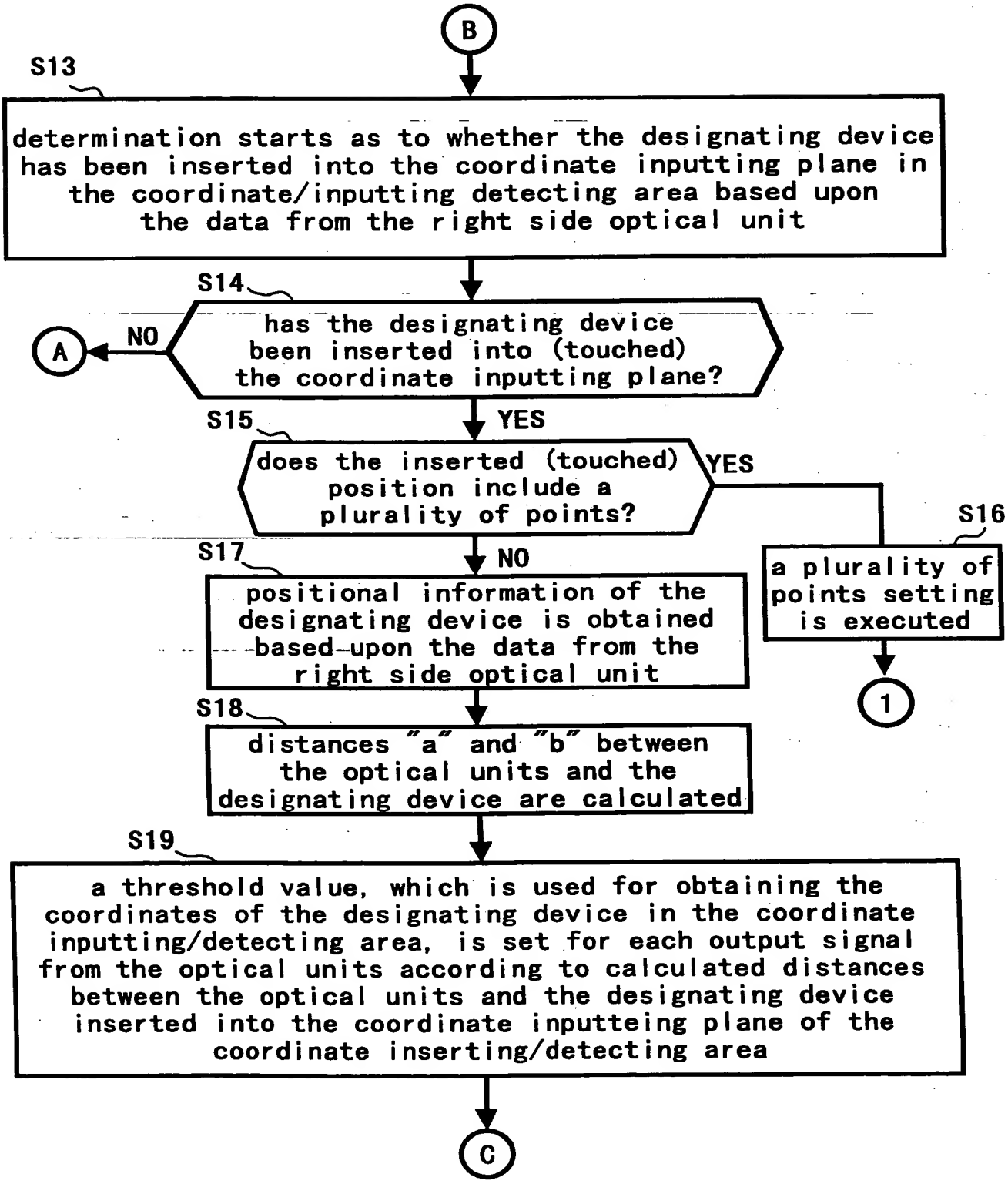

B
S13
determination starts as to whether the designating device has been inserted into the coordinate inputting plane in the coordinate/inputting detecting area based upon the data from the right side optical unit
S14
has the designating device been inserted into (touched) the coordinate inputting plane?
NO
A
YES
S15
does the inserted (touched) position include a plurality of points?
YES
S16
a plurality of points setting is executed
1
NO
S17
positional information of the designating device is obtained based upon the data from the right side optical unit
S18
distances "a" and "b" between the optical units and the designating device are calculated
S19
a threshold value, which is used for obtaining the coordinates of the designating device in the coordinate inputting/detecting area, is set for each output signal from the optical units according to calculated distances between the optical units and the designating device inserted into the coordinate inputteing plane of the coordinate inserting/detecting area
C

FIG. 7C

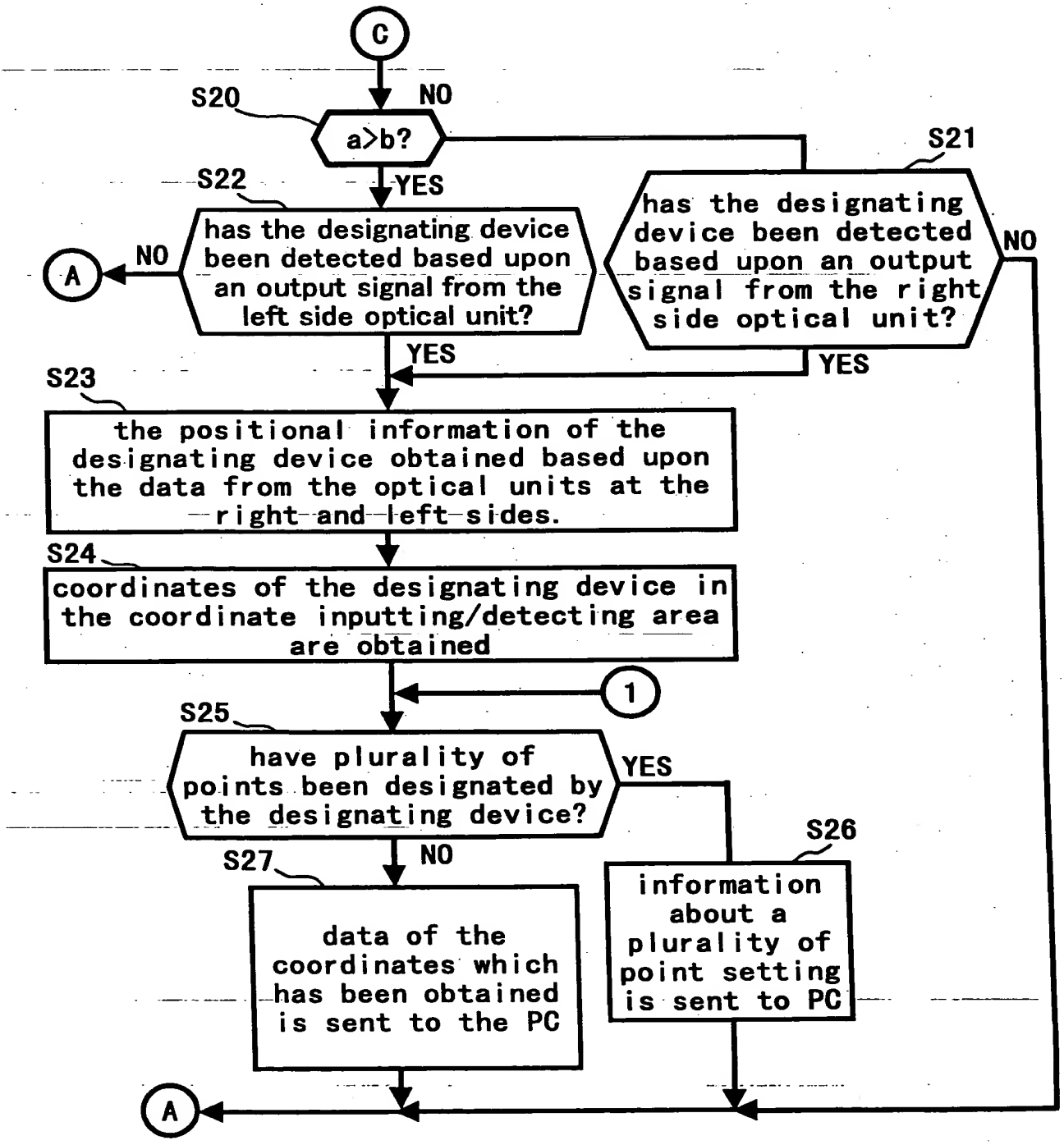

C
S20
NO
a>b?
YES
S21
S22
has the designating device been detected based upon an output signal from the left side optical unit?
NO
A
has the designating device been detected based upon an output signal from the right side optical unit?
NO
YES
YES
S23
the positional information of the designating device obtained based upon the data from the optical units at the right and left sides.
S24
coordinates of the designating device in the coordinate inputting/detecting area are obtained
1
S25
have plurality of points been designated by the designating device?
YES
S26
NO
S27
data of the coordinates which has been obtained is sent to the PC
information about a plurality of point setting is sent to PC
A

FIG. 8

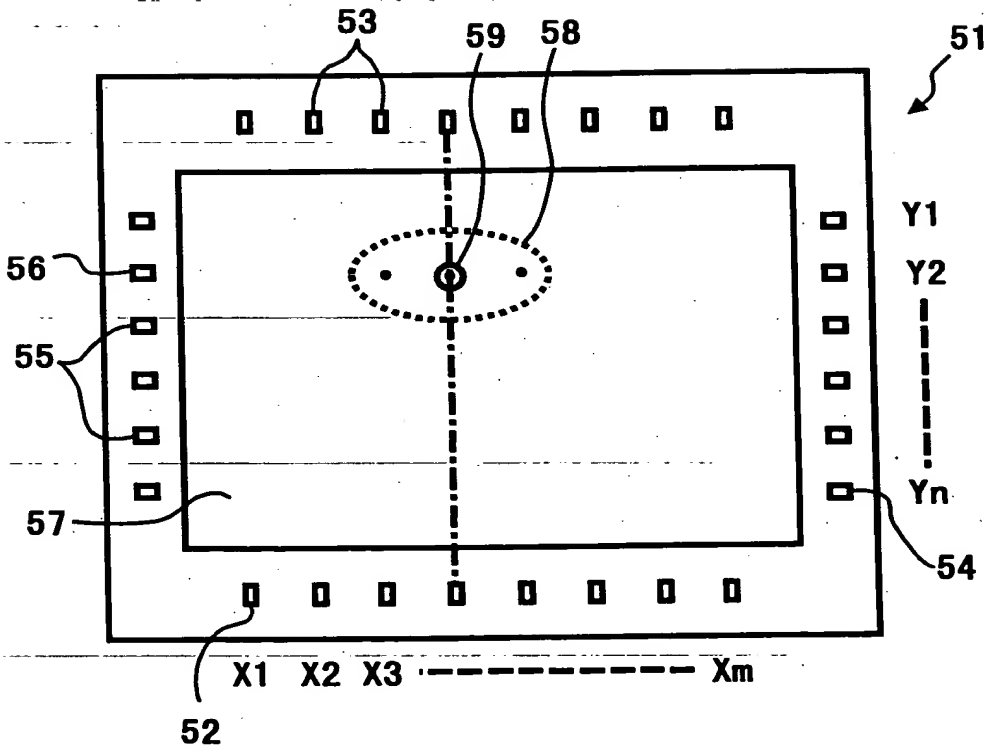


FIG. 9

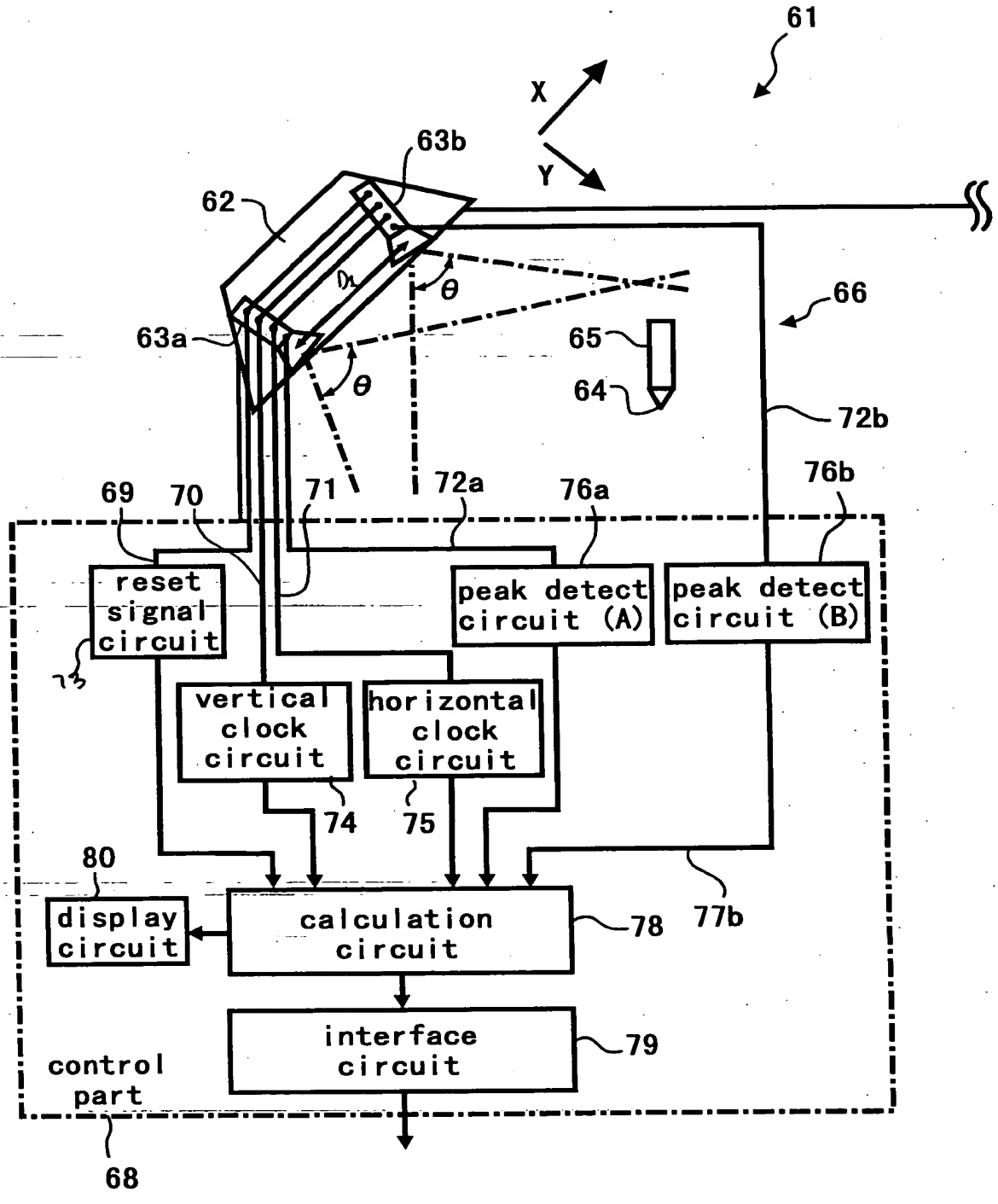

61
X
Y
63b
62
θ
66
63a
65
θ
64
72b
69
70
71
72a
76a
76b
reset signal circuit
peak detect circuit (A)
peak detect circuit (B)
73
vertical clock circuit
horizontal clock circuit
74
75
80
display circuit
calculation circuit
78
77b
interface circuit
79
control part
68

FIG. 10

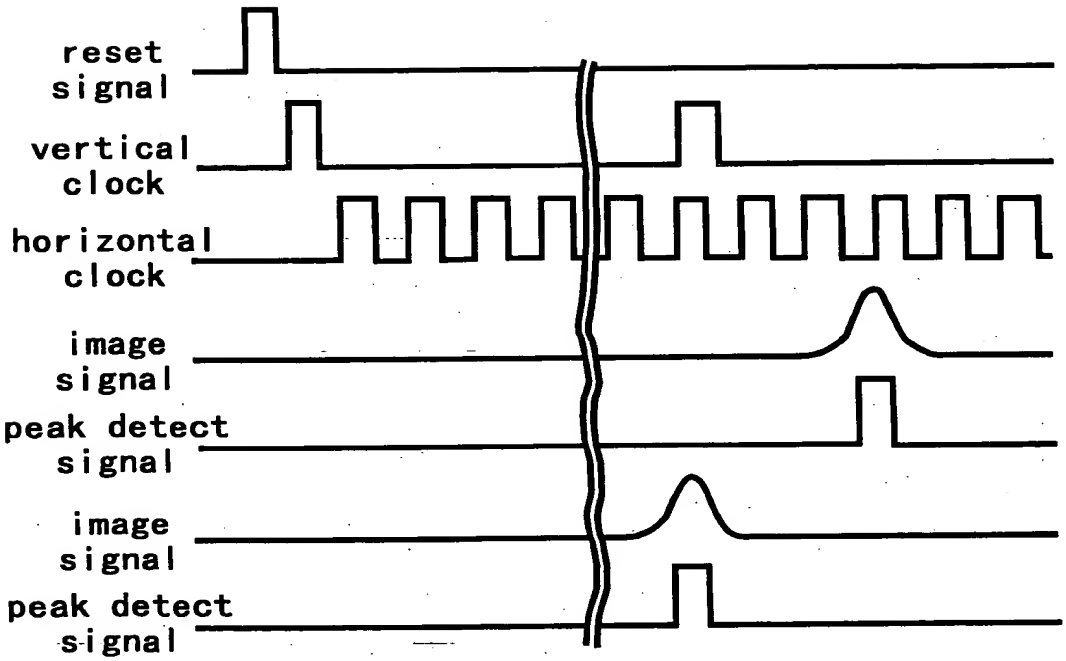
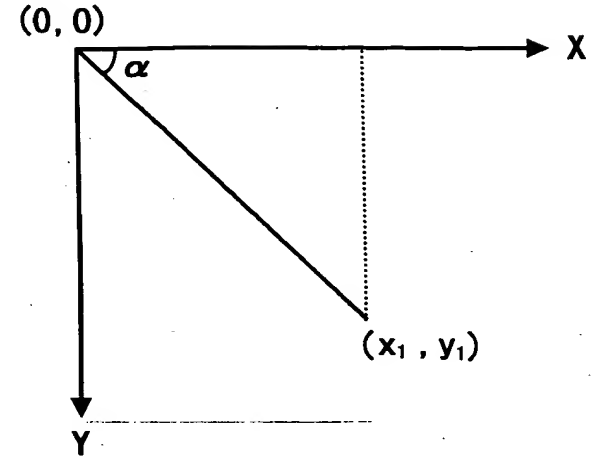
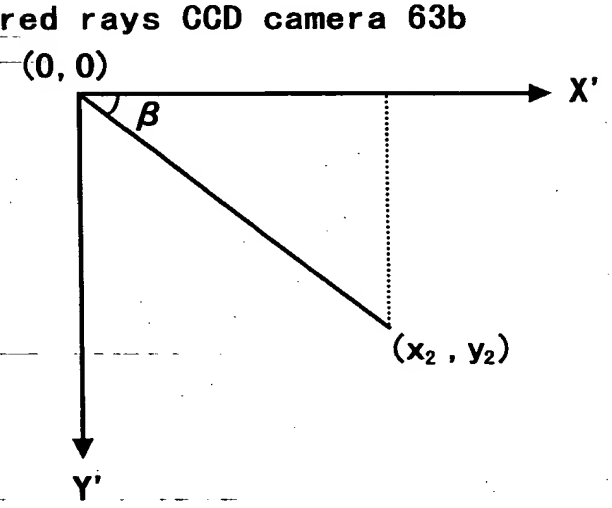

reset signal
vertical clock
horizontal clock
image signal
peak detect signal
image signal
peak detect signal

FIG. 11A



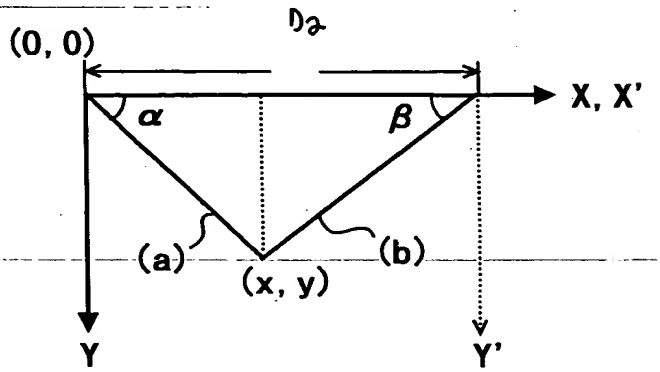
$$\frac{y_1}{x_1} = \tan \alpha$$

FIG. 11B



$$\frac{y_2}{x_2} = \tan \beta$$

FIG. 11C



$$y = \tan \alpha \cdot x$$

$$y = \tan (\pi - \beta) \cdot (x - Da)$$

FIG. 12

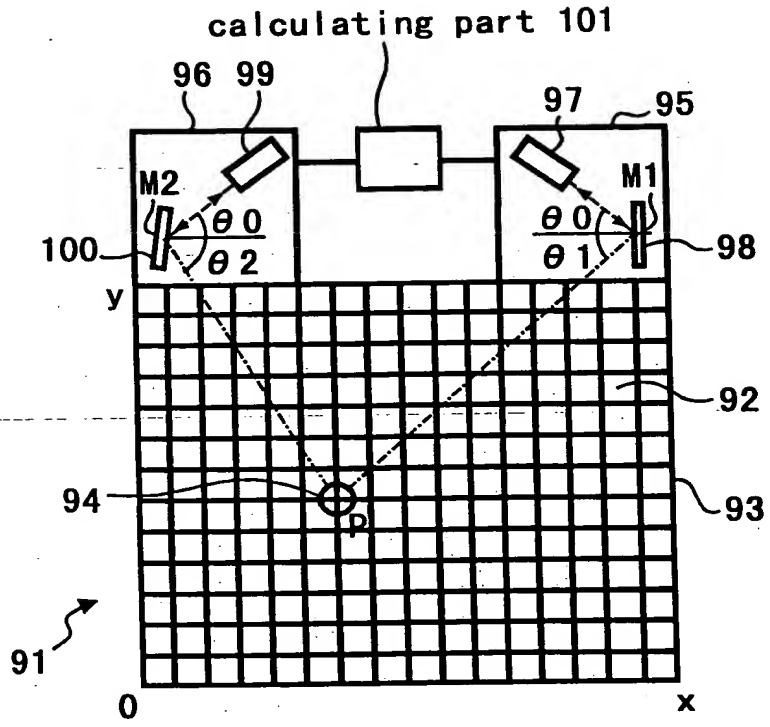

calculating part 101
96
99
97
95
M2
M1
θ0
θ2
θ0
θ1
100
98
y
92
94
P
93
91
0
x

FIG. 13

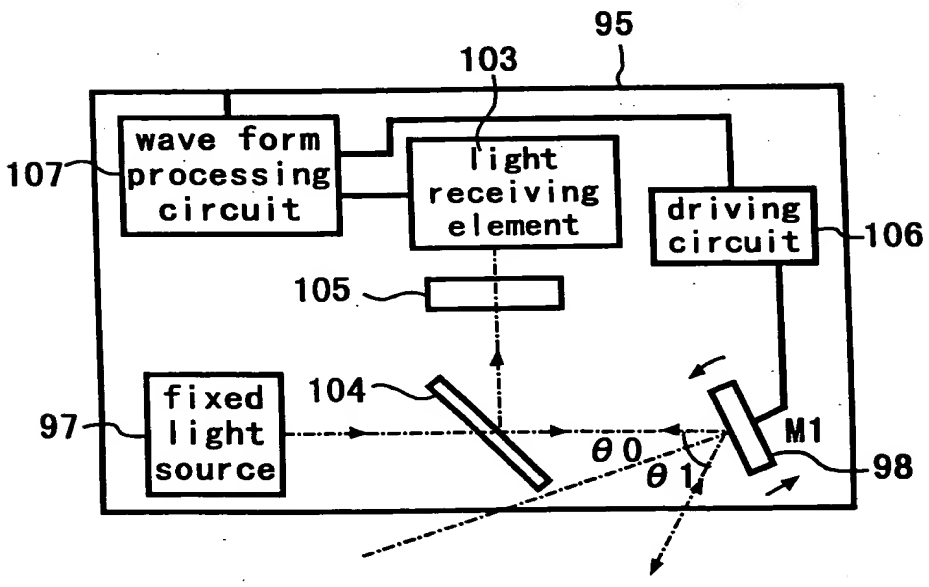

95
103
wave form processing circuit
107
light receiving element
driving circuit
106
105
fixed light source
97
104
M1
θ0
θ1
98

FIG. 14

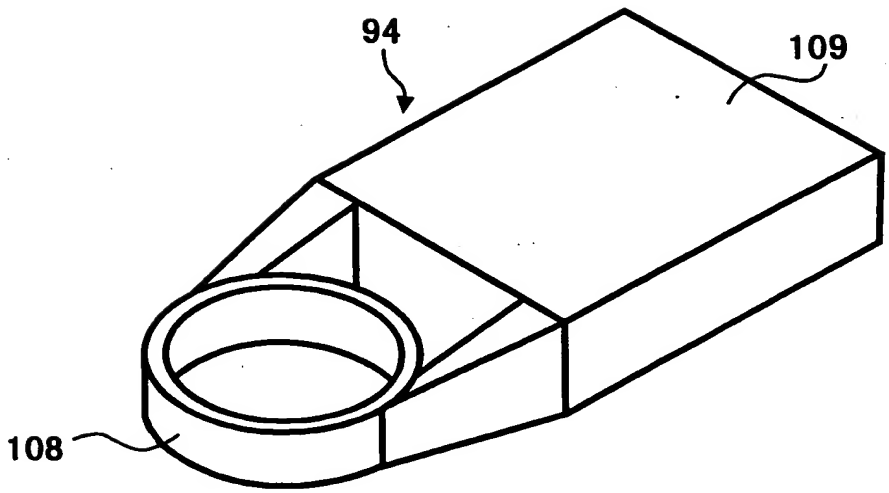


FIG. 15

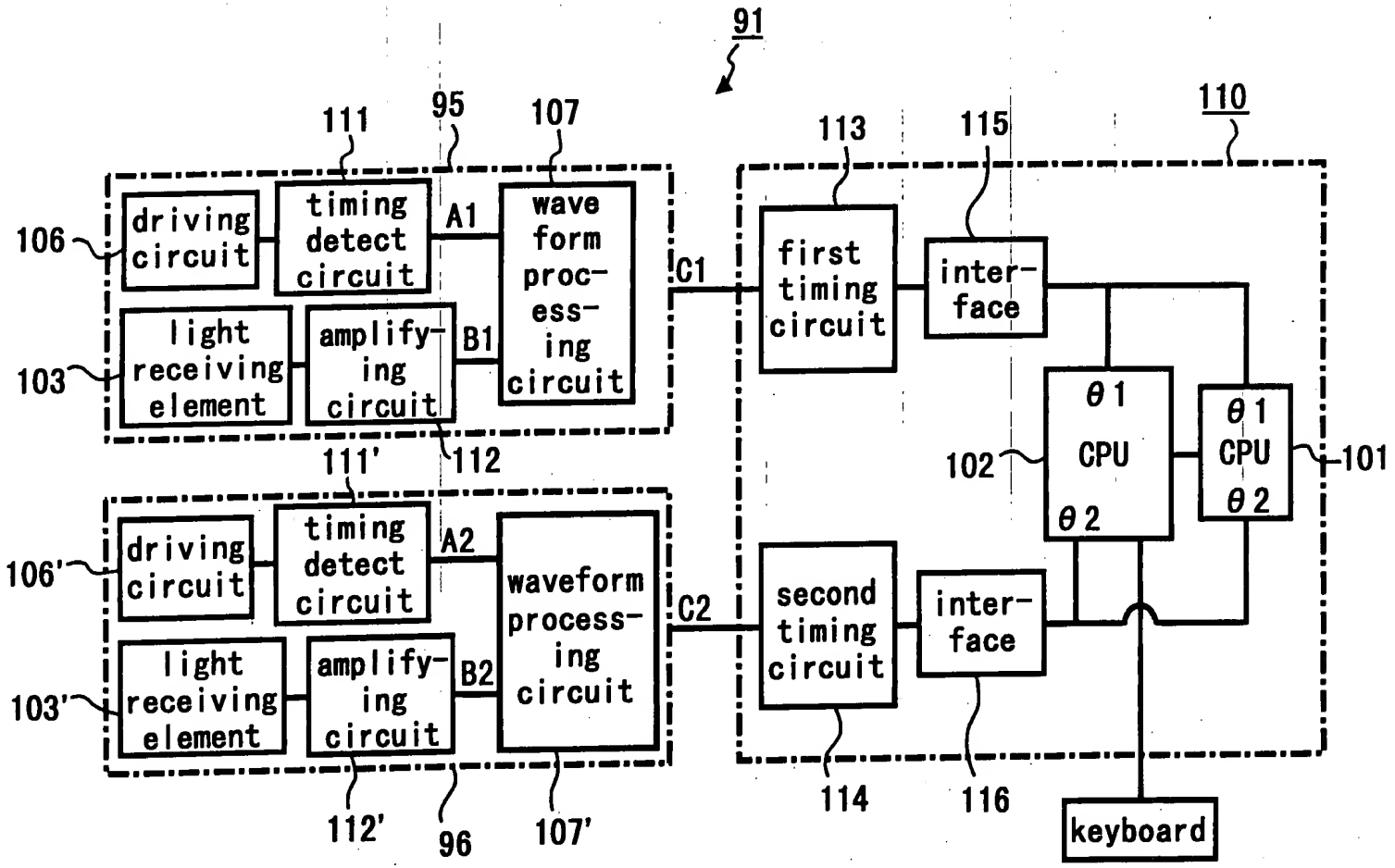

91
111
95
107
110
113
115
106
driving circuit
timing detect circuit
A1
wave form proc-ess-ing circuit
C1
first timing circuit
inter-face
light receiving element
103
amplify-ing circuit
B1
θ1 CPU θ2
102
θ1 CPU θ2
101
111'
112
106'
driving circuit
timing detect circuit
A2
waveform process-ing circuit
C2
second timing circuit
inter-face
light receiving element
103'
amplify-ing circuit
B2
112'
96
107'
114
116
keyboard

FIG. 16

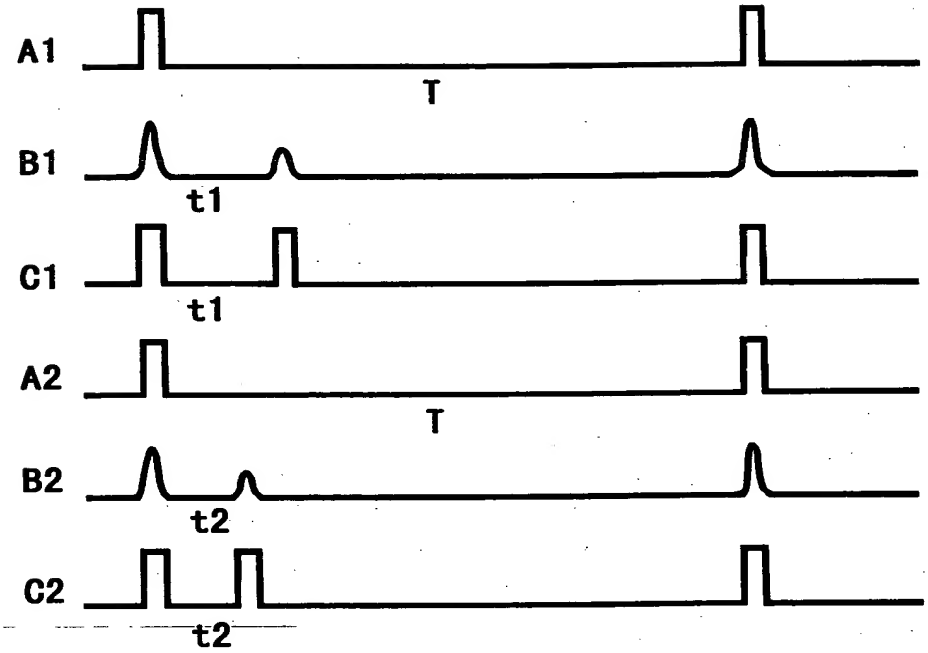


FIG. 17

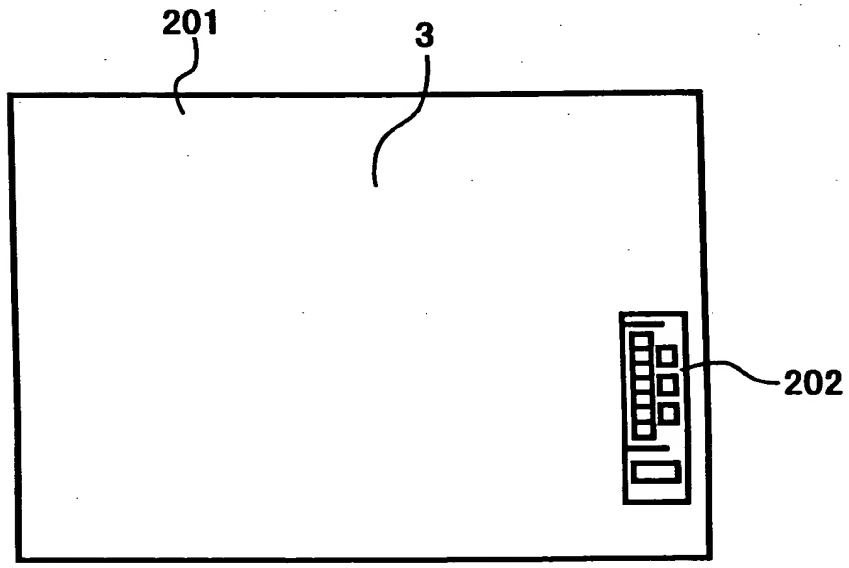


FIG. 18

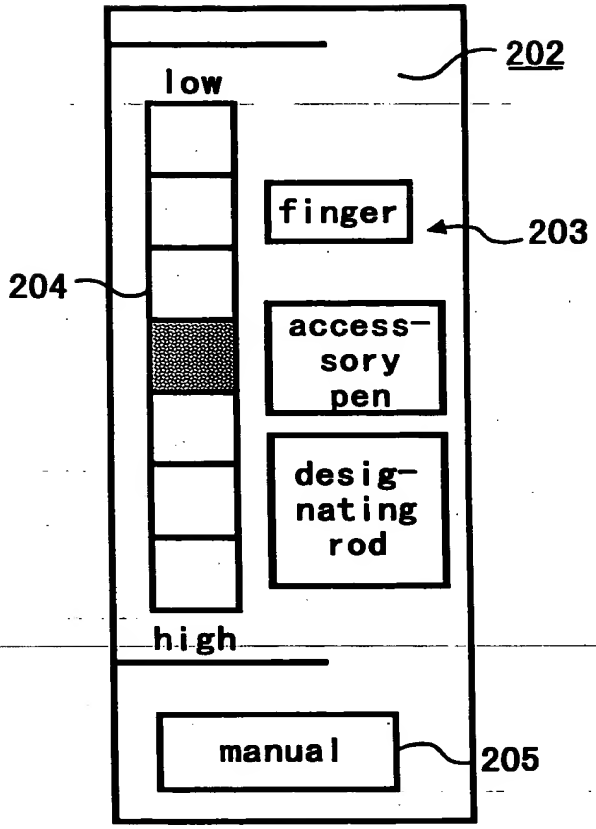

202
low
finger
203
204
access-
sory
pen
desig-
nating
rod
high
manual
205

FIG. 19

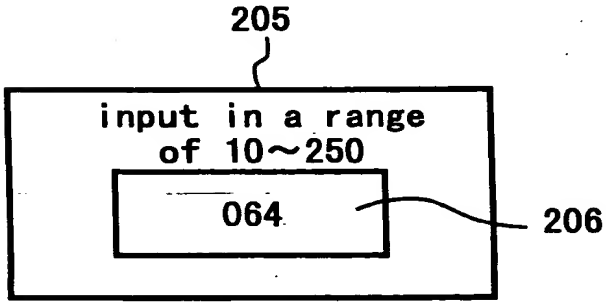

205
input in a range
of 10~250
064
206

FIG. 20

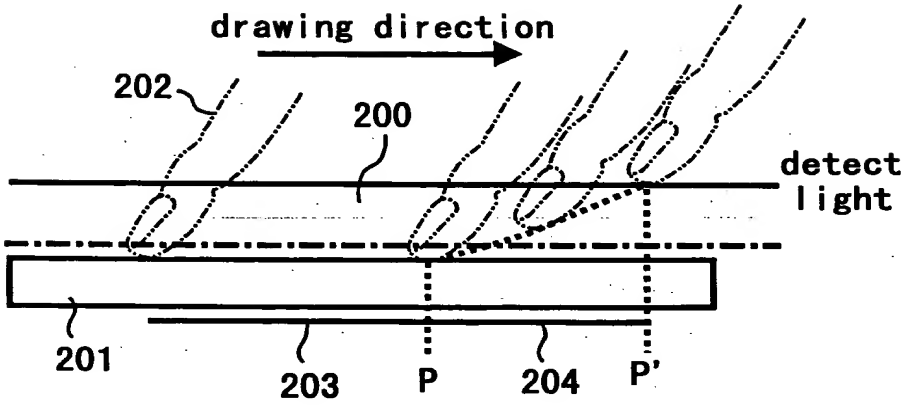


FIG. 21A

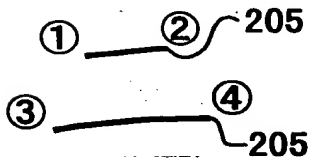


FIG. 21B

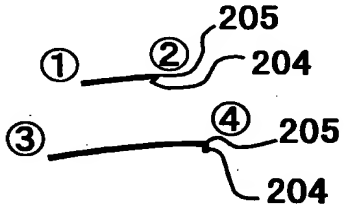


FIG. 21C

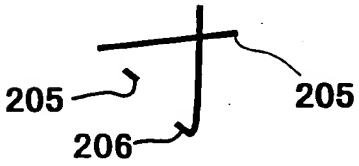


FIG. 21D

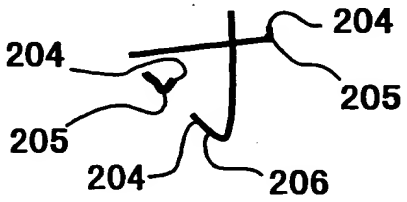


FIG. 21E

FIG. 21F